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(54) [Title of the Invention]

Noncrystalline Polyester Resin Composition for Hot-Press Molding, And Manufacturing Method For Noncrystalline Polyester Resin Sheet

(57) [Summary]

[Object] To provide a noncrystalline polyester resin composition for hot-press molding whereby an excellent surface appearance can be formed without surface irregularity and the like on the surface of a sheet, and whereby uniformity in the sheet thickness can also be maintained, and to provide a manufacturing method for a noncrystalline polyester resin sheet.

[Means of Achievement] A composition containing 0.1 to 3 parts by weight of a fatty acid ester, 1 to 20 parts by weight of a methacrylic acid ester/acrylic acid ester copolymer, and 5 to 40 parts by weight of an MBS copolymer with respect to 100 parts by weight of a noncrystalline

polyester resin. A resin composition having this type of composition is calender molded to obtain a rolled sheet, and this rolled sheet is hot-press molded under conditions of a heating temperature of 120 to 170°C and a pressure of 300 to 8000 kPa.

[Claims]

[Claim 1] A noncrystalline polyester resin composition for hot-press molding, characterized in comprising the following components with respect to 100 parts by weight of a noncrystalline polyester resin:

0.1 to 3 parts by weight of a fatty acid ester;

1 to 20 parts by weight of a methacrylic acid ester/acrylic acid ester copolymer; and

5 to 40 parts by weight of a graft copolymer obtained by the graft polymerization, in one or more stages, of at least one type of monomer selected from the group that includes alkyl methacrylate esters having a C1-4 alkyl group, alkyl acrylate esters having a C1-8 alkyl group, acrylonitriles, and styrene-based compounds onto butadiene rubber or a copolymer used as a core polymer and obtained by copolymerizing butadiene and at least one type of compound selected from the group that includes styrene-based compounds and alkyl (meth)acrylate esters.

[Claim 2] The noncrystalline polyester resin composition for hot-press molding according to claim 1, wherein the graft copolymer comprises a methyl methacrylate/butadiene rubber/styrene copolymer.

[Claim 3] The noncrystalline polyester resin composition for hot-press molding according to claim 1 or 2, wherein the noncrystalline polyester resin comprises a copolyester resin in which 10 to 70 mol% of the ethylene glycol component in polyethylene terephthalate is substituted with cyclohexane dimethanol.

[Claim 4] A manufacturing method for a noncrystalline polyester resin sheet, characterized in comprising the steps of obtaining a rolled sheet by calendering the resin composition according to claims 1 through 3; and hot-press molding the rolled sheet under conditions of a heating temperature of 120 to 170°C and a pressure of 300 to 8000 kPa.

[Claim 5] The manufacturing method for a noncrystalline polyester resin sheet according to claim 4, wherein the surface state of a mirror plate is transferred to the surface of the rolled sheet by performing the hot-press molding while a mirror plate is mounted between the press and the rolled sheet.

[Detailed Description of the Invention]

[0001]

[Technological Field of the Invention] The present invention relates to a noncrystalline polyester resin composition for hot-press molding whereby an excellent surface appearance can be formed without surface irregularity and other defects, and to a manufacturing method for a noncrystalline polyester resin sheet.

[0002]

[Prior Art] Noncrystalline polyester resin sheets provide excellent mechanical characteristics, and are also widely used in displays, construction materials, packaging materials, and the like due to their excellent adhesion, thermal workability, and other secondary molding properties.

[0003] Extrusion molding has been used in the past for the sheet molding of noncrystalline polyester resins.

[0004]

[Problems to Be Solved by the Invention] However, when sheet molding is performed by extrusion molding, drawbacks arise in that die lines, irregularities, and the like occur on the sheet surface due to defects being transferred to the surface of the sheet, and a noncrystalline polyester resin sheet with a good surface appearance is difficult to obtain. It is particularly difficult to adapt to the requirements of display applications and other applications that have strict requirements for excellent surface appearance.

[0005] In order to overcome such drawbacks, the inventors have investigated a method whereby a rolled sheet of a noncrystalline polyester resin is obtained by calendering, and then the sheet is hot-press molded. This hot-press molding involves, for example, inserting and mounting a rolled sheet molded by calendering between a pair of metal sheets (hereinafter referred to as "mirror plates") on which gloss machining, embossing, or the like is performed, and performing pressing in a heated state using a pair of presses positioned above and below in this state, whereby excellent transferability from the mirror plate to the sheet, and markedly enhanced surface appearance compared to the aforementioned extrusion molding method can be anticipated.

[0006] Since this noncrystalline polyester resin has strong adhesion to metal when molten, has low tensile strength in the molten state, and possesses other properties, it has been difficult to perform the aforementioned calendering and hot-press molding in a satisfactory state.

[0007] Specifically, the following drawbacks occur. 1) The noncrystalline polyester resin adheres to the metal calender roller during calendering, and it is difficult to smoothly and uniformly peel the rolled sheet from the metal calender roller. 2) Due to the low tensile strength of the noncrystalline polyester resin, the bank between the calender rolls is not constant, and severe irregularities occur on the surface of the sheet thus obtained, whereby these irregularities naturally remain on the surface of the sheet even after the sheet is hot-press molded.
3) Furthermore, since the resin has low tensile strength in the molten state, the resin that has lost its tensile strength during hot-press molding is caused to flow between the mirror plates, thus making it impossible to obtain a sheet with uniform thickness.
[0008] The present invention was perfected in view of the drawbacks of the prior art, and an object thereof is to provide a noncrystalline polyester resin composition for hot-press molding whereby an excellent surface appearance can be formed without surface irregularity and the like occurring on the surface of a sheet, and whereby uniformity in the sheet thickness can also be maintained, and to provide a manufacturing method for a noncrystalline polyester resin sheet.

[0009]
[Means Used to Solve the Above-Mentioned Problems] As a result of concentrated investigation aimed at overcoming the aforementioned drawbacks, the inventors perfected the present invention upon discovering that drawbacks 1) through 3) described above can be at once overcome with a composition containing a specific quantity of a fatty acid ester, a specific quantity of a methacrylic acid ester/acrylic acid ester copolymer, and a specific quantity of a specific graft copolymer with respect to a noncrystalline polyester resin; specifically, that a noncrystalline polyester resin sheet having uniform thickness that is provided with excellent surface appearance and devoid of surface irregularities is obtained by hot-press molding after this resin composition is calendered.
[0010] Specifically, the noncrystalline polyester resin composition for hot-press molding according to the present invention is characterized in comprising the following components with respect to 100 parts by weight of a noncrystalline polyester resin: 0.1 to 3 parts by weight of a fatty acid ester; 1 to 20 parts by weight of a methacrylic acid ester/acrylic acid ester copolymer; and 5 to 40 parts by weight of a graft copolymer obtained by the graft polymerization, in one or more stages, of at least one type of monomer selected from the group that includes alkyl methacrylate esters having a C1-4 alkyl group, alkyl acrylate esters having a C1-8 alkyl group,

acrylonitriles, and styrene-based compounds onto butadiene rubber or a copolymer used as a core polymer and obtained by copolymerizing butadiene and at least one type of compound selected from the group that includes styrene-based compounds and alkyl (meth)acrylate esters..

[0011] Since a noncrystalline polyester resin is used as the principal resin, a sheet can be provided that has excellent adhesion, thermal workability and other secondary molding properties, and mechanical characteristics. Since a specific quantity of a fatty acid ester is also admixed therein, the composition has excellent release properties from the calender rolls, and the rolled sheet can be smoothly and uniformly released during calendering. Since a specific quantity of a methacrylic acid ester/acrylic acid ester copolymer is also admixed therein, the composition has high tensile strength in the molten state during hot-press molding, and such phenomena as flow of the resin composition between mirror plates are prevented, whereby a sheet is obtained that has extremely uniform thickness. Furthermore, since a specific quantity of the aforementioned specific graft copolymer is admixed therein, the resin composition is endowed with high tensile strength during calendering, whereby the bank becomes constant, and irregularities are effectively prevented from occurring on the surface of the sheet.

[0012] Methyl methacrylate/butadiene rubber/styrene copolymer (MBS copolymer) is preferably used as the graft copolymer, and since the tensile strength of the resin composition during calendering is further increased by the use of this graft copolymer, the occurrence of irregularities on the surface of the rolled sheet is reliably prevented.

[0013] A copolyester resin in which 10 to 70 mol% of the ethylene glycol component in polyethylene terephthalate is substituted with cyclohexane dimethanol is preferably used as the noncrystalline polyester resin, whereby thermal workability and other secondary molding properties are further enhanced.

[0014] The manufacturing method for a noncrystalline polyester resin sheet according to the present invention is characterized in comprising the steps of obtaining a rolled sheet by calendering any of the aforementioned resin compositions and hot-press molding the rolled sheet under conditions of a heating temperature of 120 to 170°C and a pressure of 300 to 8000 kPa. By this method, since the resin composition having the aforementioned composition is hot-press molded after being calendered, a noncrystalline polyester resin sheet with a uniform thickness can be manufactured that is provided with excellent adhesion, secondary workability, and mechanical characteristics, as well as an excellent surface appearance devoid of surface

irregularities. Furthermore, since hot-press molding is performed while the heating temperature and pressure are set within the aforementioned specific ranges, the occurrence of irregularities can be reliably prevented, and the uniformity of the sheet thickness can be reliably maintained.

[0015] A resin sheet having an excellent surface appearance can be manufactured when the surface state of a mirror plate is transferred to the surface of the rolled sheet by performing the aforementioned hot-press molding while a mirror plate is mounted between the press and the rolled sheet.

[0016]

[Embodiments of the Invention] The noncrystalline polyester resin composition for hot-press molding according to the present invention contains specific quantities of a fatty acid ester, a methacrylic acid ester/acrylic acid ester copolymer, and a specific graft copolymer with respect to 100 parts by weight of a noncrystalline polyester resin.

[0017] The noncrystalline polyester resin is not subject to any particular limitation, but the use of a copolyester rein in which 10 to 70 mol% of the ethylene glycol component in polyethylene terephthalate is substituted with cyclohexane dimethanol is preferred for the ability to better enhance thermal workability and other secondary molding properties. Since a crystalline resin results when the substituted quantity of cyclohexane dimethanol in the resin is outside the aforementioned range (10 to 70 mol%), calendering becomes difficult to perform.

[0018] Examples of the fatty acid ester include lower alcohol esters of fatty acids, polyhydric alcohol esters of fatty acids, fatty acid polyglycol esters, and the like. More specifically, lower alcohol esters of fatty acids include, for example, ethyl palmitate, butyl stearate, and the like; polyhydric alcohol esters of fatty acids include, for example, hydrogenated castor oil and the like; and fatty acid polyglycol esters include, for example, ethylene glycol monostearate, propylene glycol monostearate, and the like. This fatty acid ester may be partially saponified, and montanic acid ester wax and the like, for example, may also be used.

[0019] The content of the fatty acid ester must be 0.1 to 3 parts by weight with respect to 100 parts by weight of the noncrystalline polyester resin. If this content is less than 0.1 parts by weight, the resin composition strongly adheres to the calender rolls during calendering, its release properties are adversely affected, and calendering becomes impossible. If this content exceeds 3 parts by weight, the resin composition loses its tensile strength during hot-press molding, whereby flow occurs in the resin composition between the mirror plates, resulting in an

uneven sheet thickness. Within this content range, an added quantity of the fatty acid ester of 0.3 to 1.5 parts by weight with respect to 100 parts by weight of the noncrystalline polyester resin is suitable.

[0020] The methacrylic acid ester/acrylic acid ester copolymer is not subject to any particular limitation, but one having a weight-average molecular weight of 1,000,000 to 3,000,000 is suitable for its ability to markedly increase the tensile strength in the molten state during hot-press molding. Examples of the methacrylic acid ester monomer in the aforementioned copolymer include methyl methacrylate, ethyl methacrylate, butyl methacrylate, 2-ethylhexyl methacrylate, lauryl methacrylate, cyclohexyl methacrylate, benzyl methacrylate, phenyl methacrylate, and the like. Examples of the acrylic acid ester monomer in the aforementioned copolymer include ethyl acrylate, butyl acrylate, 2-ethylhexyl acrylate, lauryl acrylate, stearyl acrylate, benzyl acrylate, phenyl acrylate, and the like. This methacrylic acid ester/acrylic acid ester copolymer may also have other monomer components copolymerized therein, and examples of such monomers include styrene, α-methylstyrene, vinyl toluene, chlorostyrene, and other aromatic vinyl compounds; acrylonitrile, methacrylonitrile, and other vinyl cyanide compounds; vinyl acetate and other vinyl esters; maleic anhydride and other dicarboxylic acid anhydrides; and the like, but these specific examples are not limiting.

[0021] The added quantity of the methacrylic acid ester/acrylic acid ester copolymer must be 1 to 20 parts by weight with respect to 100 parts by weight of the noncrystalline polyester resin. When this content is less than 1 part by weight, the tensile strength in the molten state during hot-press molding decreases, and flow occurs between the mirror plates in the resin composition that has lost its tensile strength, resulting in an uneven sheet thickness. When this content exceeds 20 parts by weight, the heat shrinkage properties of the resin composition becomes too pronounced, and friction between the resin composition and the mirror plate occurs due to shrinkage in the cooling process during hot-press molding, which results in the surface of the sheet being damaged by abrasion. Within the aforementioned content range, an added quantity of the methacrylic acid ester/acrylic acid ester copolymer of 5 to 15 parts by weight with respect to 100 parts by weight of the noncrystalline polyester resin is preferred.

[0022] The aforementioned specific graft copolymer is a graft copolymer obtained by the graft polymerization, in one or more stages, of at least one type of monomer selected from the group that includes alkyl methacrylate esters having a C1-4 alkyl group, alkyl acrylate esters having a

C1-8 alkyl group, acrylonitriles, and styrene-based compounds onto butadiene rubber or a copolymer used as a core polymer and obtained by copolymerizing butadiene and at least one type of compound selected from the group that includes styrene-based compounds and alkyl (meth)acrylate esters.. The term "in one or more stages" refers to graft polymerizing the at least one type of monomer in one or more steps (processes). Examples of the styrene-based compound may include styrene, α-methylstyrene, vinyl toluene, and the like.

[0023] Among these, a methyl methacrylate/butadiene rubber/styrene copolymer (MBS copolymer) is preferably used as the specific graft copolymer. This MBS copolymer is a graft copolymer (in which methyl methacrylate and styrene become a gel) obtained by grafting methyl methacrylate and styrene in one or more stages onto butadiene rubber as a core polymer, and since the tensile strength of the resin composition during calendering is increased even further by using this MBS copolymer, the occurrence of irregularity on the surface of the rolled sheet can be reliably prevented, and a noncrystalline polyester resin sheet is also provided that has an excellent surface appearance.

[0024] The average particle diameter of the specific graft copolymer is not subject to any particular limitation, and is preferably in the range of 800 to 2500 angstrom.

[0025] The added quantity of the specific graft copolymer must be 5 to 40 parts by weight with respect to 100 parts by weight of the noncrystalline polyester resin. If the content thereof is less than 5 parts by weight, the tensile strength of the resin composition during calendering decreases, causing the bank to become unstable, and so severe irregularity occurs on the surface of the rolled sheet, irregularities also remain on the surface of the sheet obtained after hot-press molding, and the surface appearance is adversely affected. If the aforementioned content is more than 40 parts by weight, the heat resistance of the resultant sheet is severely reduced, and the layering properties of the rolled sheets obtained by calendering decline. Within the afore-mentioned range, an added quantity of the specific graft copolymer of 10 to 30 parts by weight with respect to 100 parts by weight of the noncrystalline polyester resin is preferred.

[0026] Organic colorants, inorganic colorants, plate-out inhibitors, antistatic agents, heat resistance enhancers, weather resistance stabilizers, adhesion improvers, plasticizers, and various other additives may also be added to the resin composition of the present invention as needed.

[0027] A method such as the following, for example, may be performed during the sheet molding of the noncrystalline polyester resin composition composed as described above.

Specifically, a rolled sheet is obtained by calendering the resin composition, and a noncrystalline polyester resin sheet is then obtained by performing hot-press molding using this rolled sheet.

[0028] The aforementioned hot-press molding may be performed by mounting a pair of mirror plates above and below between a pair of top and bottom presses in a hot-press molding machine, inserting between this pair of mirror plates one or more rolled sheets obtained by calendering, and performing pressing while the presses are heated in this state, and since the surface features of the mirror plates are transferred to the surface of the rolled sheet, a resin sheet can be molded that has an excellent surface appearance.

[0029] The heating temperature during hot-press molding is preferably 120 to 170°C. A heating temperature of less than 120°C is not preferred because the fluidity of the sheet in the molten state becomes inadequate, and the layering properties between rolled sheets are adversely affected, for example. A heating temperature of more than 170°C is also not preferred because too much flow of the resin composition occurs between the mirror plates, and the uniformity of the sheet thickness is more likely to decline.

[0030] A pressure of 300 to 8000 kPa is preferably used for hot-press molding. A pressure of less than 300 kPa is not preferred because transfer from the mirror plates to the rolled sheet is more likely to be inadequate, and a pressure of more than 8000 kPa is also not preferred because too much flow of the resin composition occurs between the mirror plates, and the uniformity of the sheet thickness is more likely to decline.

[0031] Glossing, embossing, and other types of processing are generally performed on the surface of the mirror plates that contacts the sheet. Hot-press molding is preferably performed using a mirror plate, but hot-press molding may also be performed without the use of this type of mirror plate.

[0032]

[Working Examples] Specific working examples of the present invention will next be described.

[0033] <Materials used>

Noncrystalline polyester resin: "PETG14471" (manufactured by Eastman Chemical; copolyester resin in which 65 mol% of the ethylene glycol component in polyethylene terephthalate is substituted with cyclohexane dimethanol)

Noncrystalline polyester resin: "PET9921W" (manufactured by Eastman Chemical; polyethylene terephthalate)

Fatty acid ester: "Wax CAW-1" (manufactured by Clariant; montanic acid ester wax)

Methacrylic acid ester/acrylic acid ester copolymer: "Metablen P-551" (manufactured by Mitsubishi Rayon)

MBS copolymer: "B-564" (manufactured by Kaneka; average particle diameter: 2,200 angstrom)

[0034] **<Working Example 1>**: Noncrystalline polyester resin

A resin composition in which 100 parts by weight of ("PETG14471"), 0.5 parts by weight of montanic acid ester wax ("Wax CAW-1"), 10 parts by weight of methacrylic acid ester/acrylic acid ester copolymer ("Metablen P-551"), and 20 parts by weight of MBS copolymer ("B-564") were mixed was kneaded in a Henschel-type mixer, and a rolled sheet with a thickness of 0.5 mm (size: 1000 mm $\times$ 2000 mm) was obtained using a reverse L-shaped calendering machine.

[0035] Ten layers of the rolled sheet thus obtained were stacked together and inserted between a pair of mirror plates (having chrome-plated, gloss-machined surfaces) on the top and bottom, and pressed in this state by a pair of presses above and beneath for 30 minutes under conditions of a heating temperature of 150°C and a pressure of 1500 kPa. The product was then cooled to normal temperature, the closed pair of presses on the top and bottom was opened, and a noncrystalline polyester resin sheet was obtained from between the mirror plates.

[0036] **<Working Examples 2 through 4>**

Noncrystalline polyester resin sheets were obtained by the same method as described in Working Example 1 with the exception that the compositions shown in Table 1 were used as the resin composition.

[0037] **<Comparative Example 1>**

A resin composition was obtained by the same method as described in Working Example 1 with the exception that the admixed quantity of the montanic acid ester wax (fatty acid ester) was set to 0.05 parts by weight, and sheet molding by the same method as described in Working Example 1 was attempted, but the resin composition adhered to the calender rolls during the calendering stage, the release properties thereof were poor, the sheet could not be peeled off, and a molded sheet could not be obtained.

[0038] <**Comparative Example 2**>

A noncrystalline polyester resin sheet was obtained by the same method as described in Working Example 1 with the exception that the admixed quantity of the montanic acid ester wax (fatty acid ester) was set to 5 parts by weight. Flow of the molten resin composition occurred between the mirror plates during hot-press molding of this noncrystalline polyester resin sheet, and the sheet thickness thereof was uneven.

[0039] <**Comparative Example 3**>

A noncrystalline polyester resin sheet was obtained by the same method as described in Working Example 1 with the exception that the admixed quantity of the MBS copolymer was set to 1 part by weight.

[0040] <**Comparative Example 4**>

With the exception that the admixed quantity of the MBS copolymer was set to 50 parts by weight, sheet molding was attempted by the same method as described in Working Example 1, but layering defects occurred between layered rolled sheets during hot-press molding, and a resin sheet having practical value was not obtained.

[0041] <**Comparative Example 5**>

A noncrystalline polyester resin sheet was obtained by the same method as described in Working Example 1 with the exception that the admixed quantity of the methacrylic acid ester/acrylic acid ester copolymer was set to 0.5 parts by weight. Flow of the molten resin composition occurred between the mirror plates during hot-press molding of this noncrystalline polyester resin sheet, and the sheet thickness thereof was uneven.

[0042] <**Comparative Example 6**>

A noncrystalline polyester resin sheet was obtained by the same method as described in Working Example 1 with the exception that the admixed quantity of the methacrylic acid ester/acrylic acid ester copolymer was set to 30 parts by weight. Heat shrinkage of the sheet occurred in the cooling process during hot-press molding of this noncrystalline polyester resin sheet, and abrasion marks occurred on the surface thereof.

[0043] <**Comparative Example 7**>

With the exception that a crystalline polyester resin was used instead of a noncrystalline polyester resin, calendering was attempted by the same method as described in Working

Example 1, but since the resin composition did not melt uniformly, calendering could not be performed, and a molded sheet could not be obtained.

[0044] <Comparative Example 8>

A resin sheet having a thickness of 5 mm was obtained by subjecting the noncrystalline polyester resin "PETG14471" to extrusion molding in an extrusion molding machine (provided with a polishing roll having a chrome-plated glossy surface). A die line was observed on the surface of this resin sheet, and the sheet had inferior surface appearance.

[0045] Quality evaluation was performed according to the evaluation methods below for the resin sheets obtained as described above. The results thereof are shown in Tables 1 through 3.

[0046] <Method of evaluating sheet appearance>

Sheets that had an evenly glossed surface, were devoid of surface irregularities, abrasion marks, or other defects, and were adequately adapted to the requirements of a display application or other application requiring a particularly excellent sheet appearance were designated "○," and sheets in which there was localized absence of glossing, marks were left by the die, abrasion marks and other defects had been formed, and surface appearance was inferior were designated "×."

[0047] <Method of evaluating uniformity of sheet thickness>

Sheets within a thickness tolerance of ±5% with respect to the desired thickness (design thickness) of the resin sheets thus obtained were designated "○," and sheets that were outside the thickness tolerance of ±5% were designated "×."

[0048]

Table 1

		Working Example 1	Working Example 2	Working Example 3	Working Example 4
Composition/Parts by weight	Noncrystalline polyester resin "PETG14471"	100	100	100	100
	Crystalline polyester resin "PET9921W"	–	–	–	–
	Montanic acid ester wax	0.5	1	0.5	0.5
	MBS copolymer "B-564"	20	20	20	30
	Methacrylic acid ester/acrylic acid ester copolymer "Metablen P-551"	10	15	5	10
Evaluation	Sheet Appearance	○	○	○	○
	Uniformity of Sheet Thickness	○	○	○	○

[0049]

Table 2

		Comparative Example 1	Comparative Example 2	Comparative Example 3	Comparative Example 4
Composition/Parts by weight	Noncrystalline polyester resin "PETG14471"	100	100	100	100
	Crystalline polyester resin "PET9921W"	–	–	–	–
	Montanic acid ester wax	0.05	5	0.5	0.5
	MBS copolymer "B-564"	20	20	1	50
	Methacrylic acid ester/acrylic acid ester copolymer "Metablen P-551"	10	10	10	10
Evaluation	Sheet Appearance		○	×	
	Uniformity of Sheet Thickness		×	○	

[0050]

Table 3

		Comparative Example 5	Comparative Example 6	Comparative Example 7	Comparative Example 8
Composition/Parts by weight	Noncrystalline polyester resin "PETG14471"	100	100	–	100
	Crystalline polyester resin "PET9921W"	–	–	100	–
	Montanic acid ester wax	0.5	0.5	0.5	–
	MBS copolymer "B-564"	20	20	20	–
	Methacrylic acid ester/acrylic acid ester copolymer "Metablen P-551"	0.5	30	10	–
Evaluation	Sheet Appearance	○	×		×
	Uniformity of Sheet Thickness	×	○		○

[0051] As is apparent from Table 1, the molded sheets in Working Examples 1 through 4 obtained by calendering followed by hot-press molding using the noncrystalline polyester resin composition of the present invention all had excellent surface appearance, were adequately adapted to the requirements of a display application or other application in which particularly excellent sheet appearance is required, and had uniform sheet thickness.

[0052] In contrast, problems occurred in all of Comparative Examples 1 through 8 in which the ranges of the present invention were not applied, whereby sheet molding itself was difficult (Comparative Examples 1, 4, and 7), the products had inferior surface appearance (Comparative Examples 3, 6, and 8), or the sheet thickness was uneven (Comparative Examples 2 and 5).

[0053]

[Effect of the Invention] Since a noncrystalline polyester resin is used as the principal resin in the noncrystalline polyester resin composition of the present invention, excellent mechanical characteristics, adhesion, thermal workability, and other secondary processing properties are obtained. A specific quantity of a fatty acid ester is also admixed therein, so excellent release properties are obtained, and the rolled sheet can be smoothly and uniformly peeled off from the calender rolls. Since a specific quantity of a methacrylic acid ester/acrylic acid ester copolymer is also admixed therein, the tensile strength in the molten state during hot-press molding is increased, and such phenomena as flow of the resin composition occurring between the mirror plates can be prevented, so a sheet can be obtained having a highly uniform thickness. Furthermore, since the aforementioned specific graft copolymer is admixed in a specific quantity therein, the tensile strength of the resin composition during calendering is increased, whereby the bank becomes constant, so the occurrence of irregularities on the surface of the sheet is effectively prevented, and a sheet having excellent surface appearance can be obtained.

[0054] When the graft copolymer is a methyl methacrylate/butadiene rubber/styrene copolymer, the occurrence of irregularities on the surface of the rolled sheet can be effectively prevented, and the surface appearance of the resultant sheet can also be further enhanced.

[0055] When the noncrystalline polyester resin is a copolyester resin in which 10 to 70 mol% of the ethylene glycol component in polyethylene terephthalate is substituted with cyclohexane dimethanol, thermal workability and other secondary molding properties can be enhanced.

[0056] Since the manufacturing method for a noncrystalline polyester resin sheet according to the present invention is characterized in comprising the steps of obtaining a rolled sheet by calendering any of the aforementioned resin compositions and hot-press molding the rolled sheet under conditions of a heating temperature of 120 to 170°C and a pressure of 300 to 8000 kPa, a noncrystalline polyester resin sheet with a uniform thickness can be manufactured that is provided with excellent adhesion, secondary workability, and mechanical characteristics, as well as an excellent surface appearance devoid of surface irregularities.

[0057] A resin sheet having a further enhanced surface appearance can be manufactured when the surface state of a mirror plate is transferred to the surface of the rolled sheet by performing hot-press molding while the mirror plate is mounted between the press and the rolled sheet in the aforementioned manufacturing method.

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